

## CLAIMS

### WHAT IS CLAIMED IS:

1. An RF transceiver comprising:  
one or more transistors configured to generate an RF signal, wherein the RF signal has a signal wavelength;  
a substrate; and  
one or more leads, at least one of which has a length that is .1 times the signal wavelength, connecting the one or more transistors to the substrate, wherein at least one of the one or more leads radiates RF energy into, or receives energy from, free space such that at least one of the one or more leads serve as the antenna or radiator for the transceiver.
2. The apparatus of claim 1 wherein the one or more transistors are enclosed in a package and the substrate comprises a first side and a second side and at least one side of the substrate is metalized.
3. The apparatus of claim 1 wherein at least one transistor is operated as an oscillator.
4. The apparatus of claim 3 wherein at least one transistor is operated as a harmonic oscillator.
5. The apparatus of claim 1 wherein the substrate is a quarter-wavelength thick.
6. The apparatus of claim 1 further comprising a dielectric lens positioned between the one or more leads and free space.
7. The apparatus of claim 1 further comprising a detector coupled to at least one transistor.

8. The apparatus of claim 1 further comprising a planar filter positioned between the one or more leads and free space to filter the RF signal.

9. The apparatus of claim 8 wherein the planar filter is a high pass filter comprised of a metallized hatch pattern.

10. The apparatus of claim 8 wherein the planar filter is a rejection filter comprised of  $\frac{1}{2}$ -wave metallized strips at the rejection frequency.

11. A method of radiating RF energy utilizing leads from one or more transistors as the radiating elements or antennas, the method comprising:  
generating an RF signal with one or more RF transistors, the one or more RF transistors located on a substrate; and  
outputting the RF signal through one or more leads, wherein the one or more leads are configured to connect the one or more transistors to the substrate and the leads are configured to radiate the RF energy to free space.

12. The method of claim 11, further comprising focusing the RF energy radiated from the one or more leads through one or more lenses.

13. A method of radiating or receiving RF energy, wherein the RF energy is generated by a signal having an operating frequency and the operating frequency defining a corresponding wavelength, comprising:  
providing a substrate having a first side, a second side, and having a thickness that is one-quarter of the wavelength;  
metallizing the first side of the substrate to form a quarter-wave reflector;  
positioning one or more RF transistors on the second side of the substrate; and  
radiating RF energy from, or receiving RF energy with, the one or more transistors at the operating frequency using gain provided by the quarter-wave reflector.

14. The method of claim 13, further comprising providing a lens generally parallel to the second side of the substrate, the lens configured to increase gain or narrow the RF energy.

15. A method of radiating or receiving RF energy, comprising:  
positioning an RF transistor on a substrate;  
radiating RF energy from the transistor towards free-space; and  
positioning a planar filter between the RF transistor and free space to filter a component of the radiated RF energy.

16. A method of radiating RF energy, comprising:  
positioning an RF transistor on a substrate of thickness  $T$ , wherein the substrate has a front side and a back side, with the transistor on the front side;  
positioning a metallic reflecting surface on the backside of the substrate;  
operating the transistor at a frequency having a quarter wavelength equal to  $T$ ;  
radiating RF energy from the transistor to the backside through the substrate;  
and  
reflecting the RF energy from the metallic reflecting surface back through the substrate and out into free space.

17. The method of claim 16 wherein operating the transistor further comprises operating the transistor as a harmonic oscillator with a harmonic having a quarter-wavelength equal to  $T$ .